

Benefits of Construction and Demolition Waste Implementation Techniques in the Construction Project

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Abstract

Recent C&D waste reuse/recycle activities have been reviewed on the basis of India's primary C&D waste scenario. The inadequacy of resources is a chief hassle of going through the development of construction sector. One of the satisfactory practices for preventing resource degradation is reuse/recycling of Construction and demolition waste. These papers speak about the possibilities of reprocessing and repurpose waste and on site use. Finally, recommended the reuse/recycle by maintaining the quality of secondary materials and enhancing environmental sustainability on a construction project in India.

Keywords: construction, demolition, waste management, benefits, techniques, Reuse, recycling, construction project

1. INTRODUCTION

"Construction and demolition waste means the waste constitutes of building materials, debris and rubble resulting from construction, remodeling, repair and demolition of any civil structure defined by the Ministry of Environment, Forest and Climate Change (2016)". The waste generated consists of organic material and semi-inert materials. For example, mortar, bricks, damaged tiles, masonry, steel, etc. These are heavy; they occupy enormous storage space on sidewalks or waste bin. C&D waste from the individual house are through into the nearby municipal waste bin, Allows waste massive and impractical for use in nature treatment such as incineration, compositing, land filling or energy recovery. Due to its direct impact on the environmental imbalance such as vegetation production, low infiltration, etc., waste is retained in the site in some local

construction industries. Improper disposal of waste, unnecessary usage of materials, in adequate site supervision and poor knowledge of waste disposal are popular at work places. If these processes continue, resource inadequacy is a major problem of going through the construction sector's development. One of the satisfactory practices for preventing resource degradation is reuse/recycling of Construction and demolition waste. In many nations, across recent decades, significant achievements have been made in using recycled construction waste.

This study mainly specifies the reuse of waste in the construction industry. Information from various sources such as journals and guidelines related to reprocessed waste materials approach. Different sections come under this work, they are as follows. C&D waste composition is listed in section 2. The research background is in section 3. Indian waste management and construction

scenarios are included in section 4. Section 5 deals with the benefits of reuse/recycling C&D waste material. Section 6 discusses the reuse/recycling facilities (C&D) in India. Ultimately, the rating system provisions in section 7 and conclusion in section 8.

1. C&D waste Composition

C&DW is made up of concrete, soil steel, wood, plastics and other materials including brick and mortar. The composition of C&D waste varies depending on demolition operations, the components of waste and their percentage are bricks & masonry (31%), concrete (23%), soil, sand and gravel (26%), metal (5%), bitumen (2%), wood (2%) (Source: TIFAC2001).

2. Research background

The actually performed C&DW recycling has been studied from publications like articles, guidelines, and technical papers. Some articles and the year of publications as shown in figure 1 have been examined.

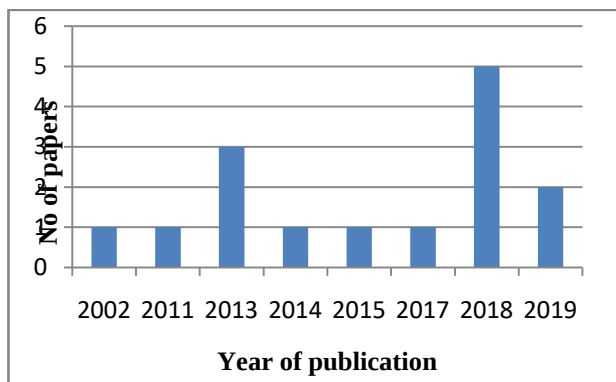


Figure 1. Number of relevant papers published in years

Some studies are done to assess recycling / reuse activities, but the use of recycled materials is limited due to lack of knowledge. This research enables the discovery of loopholes that are actually in C&D Waste Management operates. The following are some of the C&D recycling practices / techniques and their implementation in the construction industry. According to

Markandeya&Kameswari(2015), MoHUA&NITI Aayog(2019) suggests that reprocessed aggregate may be used to make concrete, Paving roads/ Sub-base layer/ nonstructural applications. Recycled timber used as hoardings by Markandeya&Kameswari (2015). Recycled brick, used as soil stabilizer/Paving temporary site access and also for the manufacture of compressed earth blocks by MoHUA& NITI Aayog (2019).

The principle of reuse/recycling motivates the theory of waste management in construction and demolition. Job Thomas, Wilson (2013) highlights the importance of the concept of reduction, reuse and recycling (3R) for waste management in India. Identify the waste that may be salvaged on a recent project or other projects. Recycling saves money by minimizing the costs of disposal. Karrar, Pandey(2013) investigated the 4R strategies used in the on-site waste management process (reduction, reuse, recycling and recovery). Reuse of raw materials, use of recyclable materials and the resource utilization may be pursuing from the raw materials purchasing to transport, use, and disposal. Beijia, et.al (2018) diagnosed the inadequate management system, the period of immature recycling, the underdeveloped market for recycled CD materials, and the industry process of immature recycling. Proposals to strengthen the present state of affairs mainly on the basis of the 3R concept, to develop an efficient circular economy model, to enhance CDW's source control and to implement innovative technologies and imposing targeted economic incentives. Markandeya, Kameswari(2015) proposes safe methods of recycling / reuse / disposal. It starts with the elimination of pollution caused by C&D waste. Sakshi Gupta, Malik RK (2018) notes that for sustainable conversion, the degree of assessment of C&D waste reuse and recycling innovation in India gets higher. Proper standards are needed for

recycled or reused materials shall define and supervise these by the Bureau of Indian Standards.

3. Indian scenario of construction and demolition waste management

A study for recycling / reuse of C&D waste on site was conducted in India (Central Building Research Institute (CBRI), Roorkee, and Central Road Research Institute (CRRRI), New Delhi). It specifies that C&DW is turned into secondary resources through reprocessing. Normal disposal practices in India are land-filling, illegal C&D waste dumping on the river, water bodies, and roadside. The reuse concept is not common to the construction firm. Mostly cities like Delhi, Mumbai pick C&D waste materials for recycling / recovery due to lack of landfill space and growing environmental concerns.

Waste control policy has been implemented by the Indian government in both the public and private sectors. The structure arrangement (reduce, reuse, recycle and disposal) from top to bottom as shown in fig 2. It starts from the most to least preferred which includes: reduction of building and demolition waste; reuse as much as possible; recycling of CDW; and secure disposal. These approaches are aimed at achieving the following targets: reducing CDW production, optimizing reuse and recycling, minimizing mixed CDW landfill intake and to introduce waste disposal charging schemes as an economic incentive to facilitate waste reduction.



Figure 2. waste management Hierarchy

4. Benefits of reuse and Recycling C&D waste materials

C&D waste material recycling which minimizes waste generation and protects the environment from different factors. Continuous recycling processes can turn waste materials into secondary resources and reduce disposal charges. Two methods (on-site and off-site process) have been reported, according to Kageishieny et.al (2018). The above methods to promote mixed building waste collection. Vivian. W. Y. Tam (2011) described the rate of reusable and recyclable waste as 'relations between actual reusable and recyclable materials and building waste. A. R. Chini advised that around 18.4 million metric tons or about 50 percent of the waste would be retrievable. Materials based reuse/recycling activities are materials are detailed as follow:

Concrete can be recycled, by grinding it into rubble and can be used in building projects. Reprocessed concrete can be used in a mixture of concrete, filling and laying of a lane over which concrete or asphalt is to be placed. The smaller pieces of concrete may be used as an aggregate, site base layer of lane construction. Poon, Koul (2002) reported that fine and coarse aggregates were supplemented as recycled aggregates (25-50 percent). As per Indian standards, it has acceptable strength. The broken bricks obtained from a renovation site were proposed by Tara, David (2013) as an alternative to coarse aggregate. Work was initially performed for the determination of crushed properties of recycled masonry aggregate. Concrete blends have been achieved that demonstrated appropriate workability and concrete properties. The studies performed to determine material properties and concrete hardness. It is possible to obtain evidence that recycled brick masonry aggregate concrete (RBMAC) can have favorable material properties. But the durability value of the hardened concrete is somewhat limited.

Timber can be recycled / reused. It can be used in coverings, shuttering, pathways, bedding of

animals or particleboards. It becomes smooth due to interaction with concrete moisture that is used as fuel. By inserting cement grout into air voids in moulds, wood-chip concrete can be prepared in the form of floors, beams, and decking. A.R. Chini said about timber products having the best recoverability stage of any building substances except for scrap metallic. It's due to the enormous volume of recoverable timber in the construction site. Recycle wood products in identical containers for reuse, recycled into mulch, or up cycled into more precious items.

Mortar / concrete prepared by sand. Monalisa Behera (2019) suggested that the use of C&D waste extracted RFA would not overcome waste management problems and could serve as an alternative sand resource for SCC activities within the firm. There's no use in the resting portion, therefore the waste is produced. That can be used in sub-base during road construction, decoration of the garden. For steel, Industry-focused on the collection, procurement, promotion and recycling of recovered materials. Rick Leblanc (2018) indicated that steel is the world's largest recycled commodity as per the American Iron and Steel Institute (AISI). Scrap steels have expense, which motivates people to recycle operations without loss of properties and acquire them on the market. About 400 million tons of steels are recycled worldwide every 12 months.

Brick may have been recycled by grinding it into rubble and can be used in building projects. In the concrete mixture, lining, and road foundation, recycled brick can be used. Waste generation from loading to unloading at a site can be broken and converted into bats and small pieces for non-structural elements. A.R. Chini says the most effective contemporary method currently used to make used bricks best suited for use in their earlier composition includes washing the mortar from the old bricks, curing concrete and using it as a sub-base road sheet, etc. It is recognized from

latest research that concrete from reprocessed glass aggregates has the toughness and insulation necessary due to insulative properties of the glass components. When a glass does not properly handle it gets destroyed. It can be used as an aggregate, stainless steel insulation, the manufacture of decorative sanitary ware, used as diffusion in brick construction. The authority was responsible for waste disposal/recycling to the junkyard citizen.

Drywall is made from gypsum. A.R. Chini says the approach can be feasible because gypsum helps the soils and plants. The recycled material is spread as a soil alteration and fertilizer over farm fields or jumbled in mushroom house beds. It can be a raw ingredient in Portland cement, used for bedding of livestock, used as a composting bulking agent and recycled into fresh drywall as well. A.R. Chini discussed that the plasterboard addressed the processing of hydrogen sulfide (H_2S) in landfill sites. H_2S has a nasty, rotten-egg smell that occurs at landfills in the U.S. and Canada for a number of reasons. Consequently, Canadian and U.S. cultures do not accept drywall in landfills, are considering regulating the quantity of drywall that can be disposed of on land.

Asphalt from shingles or asphalt concrete is recycled and may be used in pavement. Topsoil, clay, sand, and gravel are produced during Excavations that may be utilized as filler materials. Crushed asphalt shingles are used as a primary material for rural roads, used as a base layer for concrete work such as driveways and sidewalks. Adrián, et. Al, (2018), recommended that recycled asphalt can be used in low-traffic road construction, in which bitumen levels are slender and have to be quite adaptable and malleable. Muhammad Arshad, Farooq, (2017) mentioned that using reclaimed asphalt pavement (RAP 75%) new sample materials result in a more durable module than new granular samples collected under the same loading conditions.

When the quality of RAP ranged between 0 and 50 percent the residual strains increase was insignificant. Anil, Jain, (2014) research was conducted on 0 percent virgin mixtures and 40 percent RAP mixtures with reuse chemicals. With RAP mixes, stable modulus values are higher than mixes without RAP at temperatures of 25 ° C, 35 ° C and 45 ° C.

Construction and demolition Waste may comprise of various hazardous substances if dumped to the open area releasing toxic gas, hydrogen sulfide. Sorting may happen on-site, off-site, or at the recycling center. By governing the Councils and administrative bodies concerned, checking the material it is possible or impossible for recycling. The penalties should be imposed for the incorrect disposal of building waste and hazardous waste.

5. Reuse/recycling facilities(C&DW) in India

India's first construction and demolition waste recycling plant located in Burari, New Delhi has treated a huge volume of C&D waste at 2000 tons per day (TPD) and operated efficiently in 2010. The first unit becomes effective, which desires to boost the second & third unit (500 TPD & 150 TPD) of C&D Waste facilities plant in East Delhi Municipal Corporation. The results of a successful first, second and third unit of the recycling facility and need more units of C&D waste recycling plant. Therefore more recycling plants are in the planning stage (2017-2018). Indians second construction and demolition recycling plant in Ahmadabad has treated a volume of waste at 300TPD in 2014, the capacity gets increased to 600TPD in 2016 and 1000TPD in 2018. Both recycling plants are public-private partnership model is followed. The products obtained from the plants are Repurposed aggregates, manufactured sand, flagstone, kerbs, tiles, tiles, precast structures so on. Thus in India, the level of consciousness for reuse and recycling needs to be more suitable for making a feasible

transformation. Provide proper standards for reprocessed items cautionary regulated by the Indian Requirements.

Rating system:

Rating system for building is GRIHA (Green Rating for Integrated Habitat Assessment) developed by TERI (The Energy and Resources Institute) Government of India. GRIHA used to assess the reliability of buildings on the basis of conditions or benchmarks nationally accepted. For this, adopting the 5Rs waste control strategies are as follows

1. Refuse –ignorantly undertake foreign trends, components, technologies, goods, etc. Particularly from which one has to have local replacements
2. Reduce –depend on goods, technologies, procedures, so. on.
3. Reuse – Resources, goods and new strategies are able to lessen the expenses incurred in the buildings as well as their service.
4. Recycle – potential material derived from the site.
5. Reinvent – Technology, layouts and practice

The green rating system of GRIHA offers general 3 points under criteria 22, 23 & 24, each point imparting 1 point. Criteria 22 prescribes shrinking of waste throughout the renovation to gain maximum raw material recuperation and secure transfer of material over for the duration of construction and minimize the load on landfill (1point). Criteria 23 prescribe efficient waste segregation by using different colored containers for the acquiring of several group of waste on the site (1point). Criteria 24 prescribe storage and disposal of wastes by using allocating a separate place for the gathered waste earlier than moving it to the recycle/ disposal stations (1point).

6. Conclusion:

Most of the construction industry is focused on increasing efficiency without handling waste. These papers explores the opportunities of minimizing, reuse and recycle for the management of C&DW and its use on construction sites, thus reducing waste production, Increase reuse and recycle by maintaining the quality of secondary materials and enhancing environmental sustainability. To acquire these, C&D waste must be minimized by implementing C&D waste management awareness activities, waste reuse/recycling and providing quality requirements for BIS thus leads to some quantities of waste can be produced in any construction project.

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